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Quantifying the Fiscal Effects of Trade Reform

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A general equilibrium tax model estimated for 60 countries provides a simple but rigorous method for estimating the fiscal impact of trade reform

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Summary findings

Using a tax model of an open economy, Devarajan, Go, and Li provide a simple but rigorous method for estimating the fiscal impact of trade reform.

Both the direction and the magnitude of the fiscal consequences of trade reform depend on the elasticities of substitution and transformation between foreign and domestic goods, so they provide empirical estimates of those elasticities.

They also discuss the implications of their analysis for public revenue.

In general, they find that it matters what the values of the two elasticities are relative to each other. If only one of the elasticities is low (close to zero), revenue will drop unequivocally as a result of tariff reform, reaching close to the maximum drop whether or not the other elasticity is high.

For imports to grow and tariff collection to compensate for the tax cut, the import elasticity has to be high. Because of the balance of trade constraint, however, imports cannot substitute for domestic goods unless supply is able to switch toward exports. Hence, the export transformation elasticity has to be high as well.

As substitution possibilities between foreign and domestic goods increase, a tariff reform can theoretically be self-financing. But if the elasticities are less than "large," tax revenue will fall with tariff reduction and further fiscal adjustments will be necessary.

Devarajan, Go, and Li provide empirical estimates of the possible range of values for the elasticities of about 60 countries, using various approaches. The elasticities range from 0 to only 3 in most cases — nowhere near the point at which tariff reform can be self-financing.

This paper — a product of Public Economics, Development Research Group — is part of a larger effort in the group to develop and apply tools to analyze fiscal reform. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Hedy Sladovich, room MC2-609, telephone 202-473-7698, fax 202-522-1154, Internet address hsladovich@worldbank.org. Policy Research Working Papers are also posted on the Web at http://www.worldbank.org/html/dec/Publications/Workpapers/home.html. The authors may be contacted at sdevarajan@worldbank.org, dgo@worldbank.org. August 1999. (53 pages)

Quantifying the fiscal effects of trade reform:

A general equilibrium model estimated for 60 countries

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1. Introduction

Despite compelling evidence of its many benefits, trade liberalization remains an unfinished business in many parts of the world, particularly Sub-Saharan Africa. One reason is that many developing countries today are still dependent on import tariffs for revenue. Governments fear trade reform will lead to significant revenue losses in the short run. In Sub-Saharan Africa trade taxes account for 27 percent of total revenue of governments.[1] For some countries—Côte d'Ivoire, The Gambia, Madagascar, Mali, Mauritius, Niger, São Tomé and Principe, and Swaziland, for example—the dependence on trade taxes is higher than 40 percent.

A number of authors (Branson *et al.* (1992), Mitra (1992), and Greenaway and Milner (1991)) have therefore emphasized the importance of concomitant fiscal adjustment to make trade reform sustainable. But what should the size of the fiscal adjustment be? What determines the magnitude of the fiscal impact? How can it be minimized? Will the liberalization ever be self-financing? Answers to these questions typically require an elaborate tax model with its healthy, not to say rude, appetite for data. As a result, policymakers rarely have the answers when they need them. Trade reform is then either not undertaken, or done so with little knowledge of its fiscal consequences.

[1]Excluding South Africa and Nigeria; based on recent data (1992) from the World Bank's *African Development Indicators 1996*.

The purpose of this paper is to present the simplest structure of an open economy that provides a quick but clear method of quantifying the fiscal consequences of trade reform. The model can be solved analytically and we provide intuitive formulae for understanding the fiscal effects of tariff changes. In addition, we provide empirical estimates of the model's key parameters for about 60 countries.

The fiscal impact of a tariff reduction will depend directly on the size of the tariff cut, the response of imports to the tax change, and the relative importance of import tariffs as a source of government revenue. It will also depend indirectly on what happens to the other tax bases and how they in turn will affect revenue. The key to revenue performance, therefore, is how all the tax bases will change with the reform. To estimate the direct and indirect fiscal consequences, economists have often employed general-equilibrium tax models. These tax models can be quite complicated and difficult to build, particularly in view of the data constraints in many developing countries. Their complexity also makes it hard to sort out the relative importance of various factors.[2] To seek an easier but still rigorous alternative, to better understand how tax models work, and to identify what affects public revenue, this paper takes a simple analytic representation of a large class of empirical general-equilibrium models, a prototypical framework that has

[2] A recent, extensive discussion of the structure of applied general equilibrium models may be found in Ginsburg and Keyzer (1997). Past surveys are also found in Robinson (1989) or Shoven and Whalley (1984).

been shown in Devarajan *et al.* (1993, 1997) to anticipate many of the significant results of trade-focused general-equilibrium models. In this paper, we extend the framework to analyze taxes and their fiscal and welfare impact. The goal is not to capture the detailed economic and tax structure of a particular country, nor to arrive at precise estimates of the direct and indirect fiscal and welfare consequences of trade reform, but rather to isolate key parameters and ascertain their empirical magnitudes, and to provide a quick but clear way to quantify the fiscal consequences.[3]

The rest of the paper is divided into three sections. Section 2 discusses the specifications of the simple open-economy framework and its applications towards macro-fiscal policy. Key analytical results are derived. Section 3 provides estimates of these parameters for different countries and describe estimation issues and problems. A summary of conclusions follows in Section 4.

[3] This framework can be numerically implemented using widely available data from national and fiscal accounts and in a user-friendly spreadsheet format (Devarajan, Go, Lewis, Robinson, and Sinko (1997)). It has also been adapted to look at the fiscal impact of a regional custom union, see Devarajan, Go, Suthiwart-Narueput, and Voss (1997), as well as the dynamic impact of trade and macro policy, see Devarajan and Go (1998).

2. The model

2.1. The 1-2-3 model with taxation

Total public revenue, R, is defined as the sum of revenue intakes R_i from various taxes. Consider the two most important taxes in developing countries—an import tariff t_m and a domestic indirect tax. The latter may be a tax on domestic spending, t_q, which applies equally to the domestic goods and imports; or, it may be a tax on production of domestic goods, t_d, but not on the production of exports, in which case exports serve as an untaxed sector. That is,

$$R = \sum_{i=1}^{n} R_i = t_m \; \bar{e} \; \pi^m M + t_q P_q Q + t_d P_d D \tag{2.1}$$

where π^m is the world price, and M the quantity of imports; $\bar{e}$ is the foreign exchange rate; P_q is the price of domestic demand Q; and P_d is the producer price of domestic goods D.

The model in which the tax instruments are considered is a simple general equilibrium model that has one country, two activities, and three goods, or "1-2-3 model" (Devarajan *et al.* (1993, 1997)). The basic nature of the 1-2-3 model is a modified Salter-Swan methodology that separates the economy into three distinct goods: exports E, imports M, and a 'domestic' or nontraded goods D. The production of exports and domestic goods is defined by a transformation process marked by a constant elasticity of transformation Ω,

$$\bar{X} = \alpha \left(\lambda E^{\gamma} + (1-\lambda) D^{\gamma}\right)^{\frac{1}{\gamma}} \tag{2.2}$$

where $\Omega = \frac{1}{\gamma - 1}$ is the elasticity of transformation and α is a shift parameter. Output X is exogenous and constant given fixed factor endowment. From profit-maximizing behavior, the relative amount of exports and domestic goods produced is determined by their relative prices and Ω :

$$\frac{E}{D} = k \left(\frac{P_E}{P_D'}\right)^{\Omega} \tag{2.3}$$

where k is a constant equal to $\left(\frac{1-\lambda}{\lambda}\right)^{\Omega}$; P_D' is the tax-adjusted producer price $P_D(1+td)$; given the world price of exports π^E, $P_E = \pi^E\ \bar{e}$ is their domestic price.

Consumers' demand is satisfied by imports and domestic goods and is defined by a constant elasticity of substitution (CES) utility over the two goods

$$Q = \epsilon \left(\delta M^{-\rho} + (1-\delta) D^{-\rho}\right)^{\frac{-1}{\rho}} \tag{2.4}$$

where $\sigma = \frac{1}{1+\rho}$ is the elasticity of substitution and ϵ is a CES shift parameter. The proportion of imports and domestic goods consumed is affected by their relative prices and σ from the following first-order condition:

$$\frac{M}{D} = k' \left(\frac{P_D'}{P_M} \right)^{\sigma} \tag{2.5}$$

where $k' = \left(\frac{\delta}{1-\delta}\right)^{\sigma}$ is a constant. To buy Q, consumers receive income from production plus a lump-sum transfer from government, i.e., their budget constraint is

$$P_Q(1 + t_q)Q = P_X X + R \tag{2.6}$$

The expenditure tax t_q that is imposed on Q applies equally to M and D.

We assume the economy is in trade balance so that:

$$\pi^m M - \pi^e E = 0 \tag{2.7}$$

In addition, there are two price identities:

$$P_X = P_e \frac{E}{X} + P_d' \frac{D}{X} \tag{2.8}$$

$$P_Q = P_m \frac{M}{Q} + P_d' \frac{D}{Q} \tag{2.9}$$

A few remarks are in order. The model implies imperfect substitution between domestic and foreign goods. Even if the 'law of one price' prevails and perfect substitution is found among specific commodities, the elasticities of the aggregated goods will still be less than infinity whenever aggregation requires different weights because of preferences, endowment, and trade specialization.[4] In more practical terms, the CET and CES formulations allow one to avoid corner solutions or complete specialization. Because they are well-defined and intuitive to use, the two functions are popular and serve as key relationships in more disaggregated models as well.[5] In both the aggregated and disaggregated cases, it is obvious that the elasticities of the CES and CET functions will play key roles in the numerical outcomes of the models.

The model requires a price numeraire and the foreign exchange rate $\bar{e}$ is used. There are eight variables $(R, E, M, D, Q, P_d, P_X, P_Q)$ in nine equations. But by Walras' law, one of the equation is redundant so that one equation may be dropped.

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[4] Devarajan (1997) discusses the problem of defining tradable and non-tradable goods in the context of determining the real exchange rate misalignment in the CFA zone.

[5] With more disaggregation, domestic and foreign goods may be indexed over groups of commodities, i.e., E_i, M_i, D_i, where i =food, various manufactures etc. For each class of commodities, Q_i, X_i are then defined by their respective CES and CET functions. Cobb-Douglas, a special case, is sometimes used.

In the supply side, note that with fixed factors, the single output X is also fixed. With disaggregation, resource reallocation from relative price shocks and interindustry purchases come into play; a production function for each category of output and the specification of factor markets are necessary.

2.2. Consequences of a tariff reform

To derive the fiscal and welfare effects of a tariff reform, we first log-differentiate the system of equations (1)-(7), noting that (except for t_m) the growth rates of other exogenous variables $(X, e, \pi^m, \pi^e, t_d, tq)$ are zeroes:[6]

$$\hat{R} = \theta_m^R \left(\hat{t}_m + \hat{M}\right) + \theta_q^R \left(\hat{P}_q + \hat{Q}\right) + +\theta_d^R \left(\hat{P}_d + \hat{D}\right) \tag{2.10}$$

where $\theta_i^R = \frac{R_i}{R}$ is the relative weight of the tax revenue from source i and, hence, $\sum \theta_i^R = 1$. Even in this simple set-up, it is clear that the fiscal impact of a tariff reduction depends not only on $\hat{t}_m$, $\hat{M}$, and θ_m^R, but also on $\hat{D}$, $\hat{Q}$, $\hat{P}_d$, $\hat{P}_q$ and the revenue weights of domestic taxes θ_i^R's.

The growth rate of X $(= 0)$ and Q are expressed as 'weighted' averages of the growth rates of foreign and domestic goods:

$$0 = \theta_1^X \hat{E} + \theta_2^X \hat{D} \tag{2.11}$$

$$\hat{Q} = \theta_1^Q \hat{M} + \theta_2^Q \hat{D} \tag{2.12}$$

where the various weights are defined by the relative importance of foreign and domestic goods and the CET and CES parameters:

[6] That is, $\hat{y} = \frac{\partial(\ln y)}{\partial y} = \frac{\partial y}{y}$.

$$
\begin{aligned}
\theta_1^X &= \lambda\alpha^\gamma\left(\frac{E}{X}\right)^\gamma \\
\theta_2^X &= (1-\lambda)\alpha^\gamma\left(\frac{D}{X}\right)^\gamma \\
\theta_1^Q &= \delta\epsilon^{-\rho}\left(\frac{M}{Q}\right)^{-\rho} \\
\theta_2^Q &= (1-\delta)\epsilon^{-\rho}\left(\frac{D}{Q}\right)^{-\rho}
\end{aligned}
$$

Equation 2.12 is also the change in utility or welfare. The first-order conditions in turn are:

$$\hat{E} - \hat{D} = -\Omega\hat{P}_d \tag{2.13}$$

$$\hat{M} - \hat{D} = \sigma\left(\hat{P}_d - \omega_{t_m}\hat{t}_m\right) \tag{2.14}$$

In equation 2.14, $\omega_{t_m} = \frac{t_m}{1+t_m}$ is the price wedge created by t_m.

The budget constraint yields

$$\hat{P}_q + \hat{Q} = (1-\theta_R^Y)\hat{P}_x + \theta_R^Y\hat{R} \tag{2.15}$$

where θ_R^Y is the relative weight of the lump-sum tax transfer in household income.

The trade balance equation implies

$$\hat{M} = \hat{E} \tag{2.16}$$

Finally,

$$\hat{P}_x = \theta_E^{P_x X} \hat{E} + \left(1 - \theta_E^{P_x X}\right)\left(\hat{P}_d + \hat{D}\right) \tag{2.17}$$

where $\theta \frac{P_X X}{E} = \frac{P_E E}{P_X X}$, exports' share in GDP.

2.2.1. Impact on $\hat{P}_d$, $\hat{D}$, $\hat{M}$, and $\hat{E}$

An important factor in the revenue impact is the change in the price of domestic good P_d, the key endogenous price of the model. Given that world prices are exogenous, $\hat{P}_d$ determines the change in the real exchange rate, which in turn affect the allocation of the three goods in the model M, E,and D through the optimal conditions, 2.3 and 2.5. Through its effects on P_q and P_x, $\hat{P}_d$ also influences the behavior of the domestic tax bases Q and X. A specific expression for $\hat{P}_d$ can be derived (from equations 2.13, 2.14, and 2.16):[7]

[7]For an expression of $\hat{P}_d$ in terms of possible terms-of-trade shocks and their implications, see Devarajan *et. al.* (1993).

$$\hat{P}_d = \frac{\sigma\omega_{t_m}}{\sigma + \Omega}\hat{t}_m \tag{2.18}$$

All parameters in the coefficient $\frac{\sigma\omega_{t_m}}{\sigma+\Omega}$ are positive so that $\hat{P}_d$ varies directly with $\hat{t}_m$ as expected; a rise (reduction) in tariff protection will raise (lower) the price of the import substitute.

A precise expression for exports can also be obtained (from 2.11, 2.13, and 2.18):

$$\hat{E} = -\frac{\beta_1}{1 + \beta_2}\hat{t}_m \tag{2.19}$$

where $\beta_1 = \frac{\sigma\Omega\omega_{t_m}}{\sigma+\Omega}$ and $\beta_2 = \frac{E}{D}$.[8] Both β_1 and β_2 are positive so that $\hat{t}_m$, working like an export tax, affects $\hat{E}$ negatively as expected.

From the current account balance (2.16), the change in imports is the same as that of exports, i.e., $\hat{M} = \hat{E}$. Solving for $\hat{D}$, we note that the added protection afforded by a positive $\hat{t}_m$ will encourage the production of domestic or 'non-traded' goods:

[8]From equation 2.11, define $\beta_2 = \frac{\theta_1^X}{\theta_2^X}$. Using the usual budget equations for a CET function or the first-condition 2.3 to remove λ from the $\theta's$, it can be shown that $\beta_2 = \frac{P_E E}{P_d D}$. Finally, initializing prices to 1 in the base year, $\beta_2 = \frac{E}{D}$.

$$\hat{D} = \frac{\beta_1 \beta_2}{1+\beta_2} \hat{t}_m \tag{2.20}$$

Because of its modified Salter-Swan formulation, the behavior of the 1-2-3 model is shown to be consistent with traditional trade theory. In addition, the impact on E, M, D, and P_d, depend on values of the trade elasticities σ and Ω, the size of the tax wedge ω_{t_m}, and the relative importance of trade β_2. How the parameters affect revenue and welfare are examined next.

2.3. Revenue impact

2.3.1. Case 1: t_m is the only tax

Take the simplest case in which there are no domestic taxes, so that $t_q = 0$, $t_d = 0$, $\theta_q^R = 0$, $\theta_d^R = 0$, and $\theta_m^R = 1$. From 2.10, it is clear that revenue will depend on whether imports expand sufficiently to offset the cut in tariffs:

$$\hat{R} = \hat{t}_m + \hat{M}$$

Substituting the previous solution for $\hat{M}$, we find that

$$\hat{R} = k_1 \hat{t}_m$$

where

$$k_1 = 1 - \frac{\sigma\omega_{t_m}\Omega}{(\sigma+\Omega)(1+\beta_2)}$$

Can k_1 be negative? In other words, can there be a Laffer curve for tariffs? k_1 is negative if

$$\begin{aligned} \frac{\sigma\omega_{t_m}\Omega}{(\sigma+\Omega)(1+\beta_2)} &> 1 \\ \frac{\sigma\Omega}{\sigma+\Omega} &> \frac{(1+\beta_2)}{\omega_{t_m}} \end{aligned} \tag{2.21}$$

For non zero exports ($\beta_2 = \frac{E}{D} > 0$) and positive tariffs ($0 < \omega_{t_m} < 1$), note that $\frac{(1+\beta_2)}{\omega_{t_m}} > 1$. Hence, the left-hand side, $\frac{\sigma\Omega}{\sigma+\Omega}$, has to be sufficiently greater than 1, a condition that may be satisfied if both σ and Ω are high.

How high should the elasticities be? Take some feasible numerical values, $\beta_2 = \frac{2}{3}$ and $\omega_{t_m} = 0.2$ (i.e., $t_m = 0.25$), Figure 2.1 shows the revenue impact for a 50 percent reduction in tariffs for different values of σ and Ω.

A few observations can be made. Even if just one of the elasticities is low (close to zero), revenue will decline unequivocally, reaching close to the maximum drop regardless whether the other elasticity is high. This is because for imports to grow and tariff collection to compensate for the tax cut, σ has to be high. Because of the balance of trade constraint however, imports cannot substitute for domestic goods unless supply is able to switch towards exports. Hence, Ω

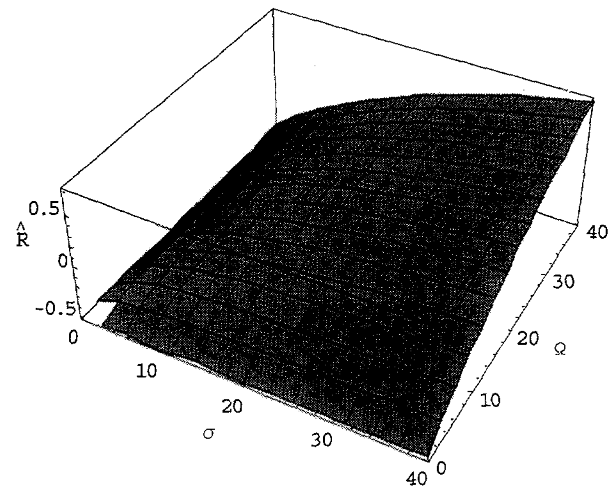

Figure 2.1: t_m is the only tax

has to be high as well. In the example given, both σ and Ω have to be greater than 20 before revenue growth becomes really positive. Hence as substitution possibilities between foreign and domestic goods increase, a tariff reform may be self-financing. Conversely, if the elasticities are less than 'large', tax revenue will fall with tariff reduction and further fiscal adjustments are necessary. The precise value of σ or Ω is of course an empirical issue, which we will examine in section 3. Note further that the higher is the initial tariff (higher ω_{t_m}) the more likely will the tariff reduction be self-financing.

2.3.2. Case 2: There is also a domestic expenditure tax t_q

What would happen to revenue if there were a domestic tax? Take the case in which the only domestic tax is an expenditure tax on Q, so that $t_d = 0, \theta_d^R = 0$ and

$$\hat{R} = \theta_m^R \left(\hat{t}_m + \hat{M}\right) + \left(1 - \theta_m^R\right) \left(\hat{P}_q + \hat{Q}\right) \tag{2.22}$$

There are two possible opposing effects on the domestic tax base – $\hat{P}_q$ will fall while $\hat{Q}$ may rise because of the cheaper imports. To investigate their net effects, note that $\left(\hat{P}_q + \hat{Q}\right)$ is an average of $\hat{P}_x$ and $\hat{R}$ in 2.15, and an expression for $\hat{P}_x$ is available in 2.17. Using the previous solutions for $\hat{P}_d, \hat{D}, \hat{M}$ and $\hat{E}$, which are unaffected by the introduction of t_q, we are also able to derive $\hat{R}$ in terms of the policy change $\hat{t}_m$:

$$\hat{R} = k_2 \hat{t}_m \text{ and } k_2 = \frac{\chi_1}{\chi_2} \tag{2.23}$$

where

$$\begin{aligned} \chi_1 \;=\; & \theta_m^R \left(\sigma + \Omega - \sigma\omega_{t_m}\Omega + \sigma\omega_{t_m} \left(\frac{\sigma\omega_{t_m}}{\sigma + \Omega}\right)^{\frac{1}{\Omega}} \beta_2\right) \\ & + \frac{\theta_q^R}{1 - \theta_R^Y} \left(\sigma\omega_{t_m}\Omega\right) \left(1 + 2\left(\frac{\sigma\omega_{t_m}}{\sigma + \Omega}\right)^{1 + \frac{1}{\Omega}} \beta_2 \left(1 - \theta_E^{P_x X}\right) - 2\theta_E^{P_x X}\right) \end{aligned}$$

and

$$\chi_2 = \left(1 - \theta_q^R \theta_R^Y\right) \left(\sigma + \Omega + \sigma\omega_{t_m} \left(\frac{\sigma\omega_{t_m}}{\sigma + \Omega}\right)^{\frac{1}{\Omega}} \beta_2\right)$$

The denominator of the coefficient k_2 is always positive, i.e., $\chi_2 > 0$. The numerator χ_1 is generally positive unless σ and Ω are sufficiently high so that $(-\sigma\omega_{t_m}\Omega)$ in the first part of the expression dominates.

Substituting the same values of the parameters in Case 1 and further assuming that tariff revenue is now one third of total revenue, $\theta_m^R = 0.33$ and that the tax rebate is 20 percent of income, $\theta_Y^R = 0.33$. Figure 2.2 shows that the revenue profile is the same as Case 1. Note that for low elasticities, the revenue decline is less than Case 1 since tariff revenue is now less important. In this case however, both elasticities now have to be a lot greater than 40 before the revenue impact is positive. The reason is that, although with a higher elasticity, the greater is the increase in M, the response of D goes in the opposite direction, rendering the effect on Q relatively neutral. Thus, policy reform generally has a negative net effect on the domestic tax base and consequently, imports have to expand a lot more to raise revenue. Nevertheless, like Case 1, a tariff reform can still finance itself with sufficiently high elasticities.

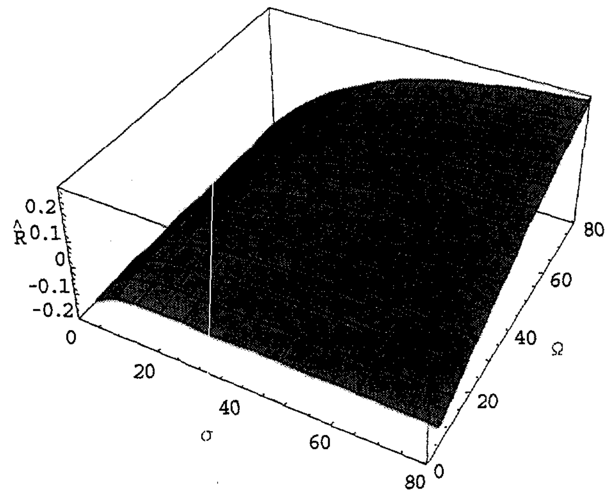

Figure 2.2: An expenditure tax exists

2.3.3. Case 3: A production tax is imposed on D but not E

In contrast to Case 2, take the case in which a production tax is levied on domestic goods D but not on exports E. $t_q = 0, \theta_q^R = 0$ and

$$\hat{R} = \theta_m^R \left(\hat{t}_m + \hat{M}\right) + \left(1 - \theta_m^R\right) \left(\hat{P}_d + \hat{D}\right) \tag{2.24}$$

Substituting previous solutions for $\hat{P}_d$, $\hat{D}$, and $\hat{M}$, we find that:

$$\hat{R} = k_3 \hat{t}_m \tag{2.25}$$

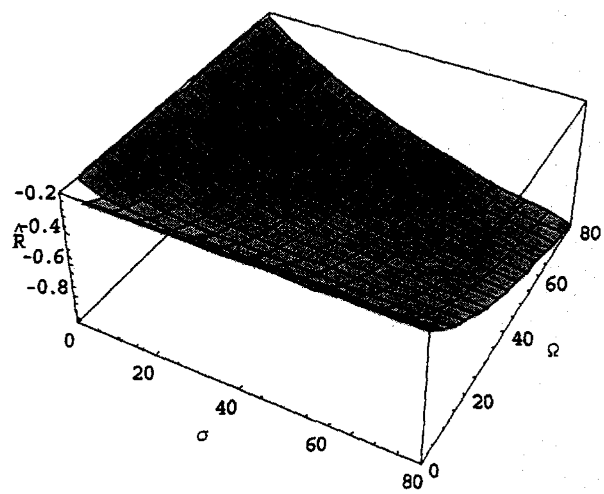

Figure 2.3: A tax on D but E untaxed

where

$$k_3 = \frac{1}{(\sigma+\Omega)(1+\beta_2)}\left[(1-\theta_m^R)\sigma\omega_{t_m}\Omega + \theta_m^R\left(\sigma+\Omega-\sigma\omega_{t_m}\Omega+(\sigma+\Omega)\beta_2\right)\right]$$

Here the result is more direct. If $\theta_m^R < 0.5$, that is, tariff revenue does not dominate total revenue, k_3 is always positive, regardless of the values of σ and Ω. From equation 2.24 P_d and D, and thus revenue from the domestic tax base, will tend to fall as both σ and Ω rise. Retaining the parameter values in Case 2, we confirm this in Figure 2.3. Hence, unlike Case 1 and 2, public revenue will always fall and it will decrease more the higher the elasticities.

2.4. Welfare impact

Using equations 2.19, 2.20, and 2.16 in the equation for $\hat{Q}$ (2.12), the growth rate in utility is derived as follows:[9]

$$\hat{Q} = k_4 \hat{t}_m \tag{2.26}$$

where

$$k_4 = \frac{\sigma \omega_{t_m} \Omega}{(\sigma + \Omega)(1 + \beta_2)} (\beta_2 \theta_2^Q - \theta_1^Q)$$

$\frac{\sigma \omega_{t_m} \Omega}{(\sigma+\Omega)(1+\beta_2)}$ is always positive. Using the familiar budget shares equations for a CES equation and initializing prices to one, it can be shown that $\theta_1^Q = \left(\frac{P_m}{P_q}\right)^{-2\rho} \left(\frac{P_m M}{P_q Q}\right)^{\frac{1}{\sigma}} = \left(\frac{M}{Q}\right)^{\frac{1}{\sigma}}$. Likewise, $\theta_2^Q = \left(\frac{D}{Q}\right)^{\frac{1}{\sigma}}$ so that welfare increases if

$$\begin{aligned} \left(\frac{M}{Q}\right)^{\frac{1}{\sigma}} &> \left(\frac{E}{D}\right)\left(\frac{D}{Q}\right)^{\frac{1}{\sigma}} \\ \left(\frac{M}{D}\right)^{\frac{1}{\sigma}} &> \left(\frac{E}{D}\right) \end{aligned} \tag{2.27}$$

[9] $\hat{Q} \approx \frac{Q-Q_0}{Q_0}$ may be interpreted as a negative equivalent variation $-EV$ as a ratio to GNP, since $EV = P_0(Q_0 - Q)$, $P_0 = 1$ and Q_0 is base-year GNP.

The intuition behind 2.27 is simple. If the curvature[10] of the isoquant is sufficiently 'flat', a condition that is easily attainable if the armington function is elastic ($\sigma > 1$), and if $M \geq E$ (for example, when the current account is balanced), k_4 will be negative and a tariff cut will lead to a welfare gain.[11]

Using the parameter values from the previous cases, we show that the welfare gain increases with the elasticities in Figure 2.4.

3. Empirical estimates of elasticities

3.1. Econometric issues

As the previous section indicates, to be able to determine the direction and quantify the size of the fiscal impact of trade reform, we need estimates of the foreign trade elasticities . Although there is large literature on trade elasticities, the estimation of trade elasticities generally applies to import demand. Exports from developing countries are modeled as import demand from importing industrial

[10] More precisely, the curvature of the CES function is

$$\frac{\partial M}{\partial D} = -\frac{(1-\delta)}{\delta}\left(\frac{M}{D}\right)^{\frac{1}{\sigma}}$$

[11] For any given set of elasticities, it is not clear whether $\hat{Q}_{case1} > \hat{Q}_{case2} > \hat{Q}_{case3}$. In case 2, Q is initially less than optimal because of the tax t_q so that increases in Q from a tariff cut might be higher; but this may be offset by a smaller income effect because of tax diversification. In case 3, a taxed D implies that it is underproduced. Shifting away from it towards the untaxed exports may not enhance welfare as much in a second-best sense. But equation 2.26 indicates that k_4 may or may not be higher. Whatever the case, it is safe to say that Q will at least be higher for plausible values of the parameters.

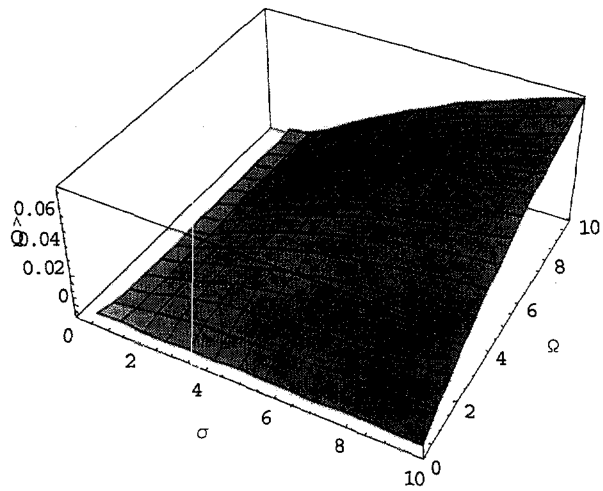

Figure 2.4: Welfare impact of tariff reform

countries. Furthermore, in estimating import demand, while the imperfect substitution model of Armington (1969) is the most prevalent specification, estimates of elasticities are usually in the form of demand price elasticities, not directly in terms of the substitution and transformation elasticities that appear in our model.

A key issue in the empirical investigations is whether changes in the real exchange rate have a significant impact on the balance of trade. The literature may be divided along how they answer the question. Most of the earlier literature, such as Branson (1972) and Khan (1974),[12] as well as others like Rittenberg (1986), and Bond(1987), and Marquez and McNeilly (1988) found that

[12] A survey can be found in Goldstein and Khan (1985).

trade flows respond significantly to changes in relative prices. However, they are today criticized for inference problems associated with time-series variables that have unit roots. Some recent empirical work that took into account the time-series properties of trade flows and prices, such as Rose (1990 and 1991) and Ostry and Rose (1992), found little evidence that relative prices matter in trade flows. The lack of theory in time-series techniques can of course create interpretation problems. Marquez (1994), for example, stressed the importance of optimizing behavior and simultaneity in determining the expenditures on domestic and foreign goods. For developing countries, Faini, Pritchett, and Clavijo (1988) discussed the importance of trade policy and restrictions, which are likely to understate the structural demand elasticities. One study by Reinhart (1995) uses time-series techniques and dynamic optimizing behavior; it finds significant trade relationships but that the aggregate price elasticities tend to be lower than unity.

There are differences in findings at the disaggregated levels as well. Brenton and Winters (1992) avoid assuming separability between home and foreign goods and find low import price elasticities. Panagariya, Shah, and Mishra (1996), on the other hand, employing better data such as explicit competitors' prices (not proxies) find high elasticities. In any case, these elasticities apply to specific groups of commodities, i.e., not at the level of aggregation desired in our model.

Another issue is the assumption of homotheticity in the Armington function, which is violated by the time trends observed in trade shares. Import and export shares in GDP for many countries appear to be increasing and independent of the relative price movements. Alston *et al.* (1990), for example, note that while the implicit assumption of homotheticity in the CES and CET formulations is theoretically appealing, it is also highly restrictive in CGE modeling. The standard correction is usually to employ a scale variable, such as an income term, to denote aggregate income activity. Alternative formulations like the almost ideal demand system (AIDS) or one of the flexible functional forms are often suggested.[13] Using AIDS, Hanson, Robinson, and Tokarick (1993) find the sectoral expenditure elasticities in United States are generally greater than one. Other AIDS estimations are found in Alston and Green (1990) and Shiells, Roland-Holst, and Reinert (1993).

While it is certainly plausible that the capacity to import among countries rises with income, Petri (1984) and Ho and Jorgenson (1997) believe that the high income elasticities estimated are probably spurious. In fact, trade shares seem to be increasing over time for rich and poor countries alike, as would be the case with increasing globalization. A natural breakpoint is the 1970s when

[13] Another possibility is to use the CES version suggested by Brown and de Cani (1963), which permits a variable degree of homogeneity while retaining a constant elasticity of substitution.

wide-ranging changes in the international monetary and trading system were implemented. Even for large industrial countries like the United States, there is a sharp acceleration in the import share in the 1970s. For developing and transitional economies, periods of rapid economic and trade liberalization (particularly in the late 1980s) are crucial factors. Compared to the earlier periods of inward-orientation, changes in trade policy in the latter periods often lead to structural breaks in the trade shares. To account for the shifts in trade shares, a time trend or a function like the logistic curve is recommended.

There are very few studies that investigate export supply explicitly. Diewert and Morrison (1988) employ a production-based approach originally developed in Kohli (1978) to obtain export supply and import demand. A recent cross-country estimation of export demand and price elasticities that account for nonstationarity is by Senhadji and Montegro (1998). Faini (1994) is one study that estimates transformation elasticities from a CET function directly and that takes into account adjustment lags, factor prices, and the importance of capacity utilization. He finds that the CET elasticity to be less than one for Morroco but much greater than one for Turkey. In general, it would be difficult to replicate these studies for many countries without extensive micro data. Part of the problem is the measurement problems of factor accumulations and their returns. Another issue is the adjustment lags in supply that may require measurement of capacity utilization.

3.2. Estimation methods and results

In this paper, we employ a variety of methods to estimate our critical parameters, σ and Ω. Tables 1 and 2 tabulate the Armington and CET elasticities estimated using these various methods. No single method provides uniformly good estimates for all countries in the sample. In the tables, we provide only those estimates that have positive (or correct) signs and significant coefficients. Between the two elasticities, CET elasticities tended to be estimated more frequently with the wrong sign or insignificant coefficients. One problem is that the aggregate price indices of imports, exports, and domestic good tend to move in the same fashion for many countries, dominated by underlying inflation trends and nominal exchange rate depreciation. As a result, the real exchange rates or relative prices of exports and imports over the domestic good may be indistinguishable from one another statistically. The quantities of exports and imports also tended to move together in many countries, especially during periods with balance-of-payment problems; hence, the two functions may not be fully unidentified in many instances. In addition, the CET elasticities may be affected by possible adjustment lags in supply behavior that are difficult to handle without additional micro data. Nevertheless, there are sufficiently good estimates for both elasticities in the tables. In the next subsections, we briefly describe the econometric methods employed.

3.2.1. Simple OLS results

Before considering other approaches, we estimate using OLS the two aggregate trade elasticities from the optimal conditions for import demand and export supply (equation 2.3 and 2.5). By taking logarithms, the non-linear functions are transformed into log-linear form, from which the trade elasticities are easily recovered:

$$\ln\left(\frac{M}{D}\right) = \beta + \sigma \ln\left(\frac{P^d}{P^m}\right) \tag{3.1}$$

$$\ln\left(\frac{E}{D}\right) = \alpha + \Omega \ln\left(\frac{P^e}{P^d}\right) \tag{3.2}$$

where $\alpha = \Omega \ln\left(\frac{(1-\delta_t)}{\delta_t}\right)$ and $\beta = \sigma \ln\left(\frac{\delta_q}{(1-\delta_q)}\right)$ are two constant terms. In general, the simple OLS estimation of the CET elasticities is the most problematic with the largest number of incorrect signs and insignificant coefficients.

3.2.2. Time trend, structural breaks, and scale factor

To account for the changing ratios of foreign over domestic goods, we add a time trend to the OLS. We also test the hypothesis that there is a structural break or a non-linear acceleration in the time trend due to policy reform, policy reversal, or increasing globalization. In general, it will be difficult to decide on a specific break point unless the timing of trade reform is known for specific countries. The following specification is used to test for possible structural changes

$$\ln\left(\frac{M}{D}\right) = \beta + \pi_1 t + \pi_2 I(k)t + \sigma \ln\left(\frac{P^d}{P^m}\right) + v$$

$$\ln\left(\frac{E}{D}\right) = \alpha + \delta_1 t + \delta_2 I(k)t + \Omega \ln\left(\frac{P^e}{P^d}\right) + u$$

where $I(k)$ is an indicator function which equals 1 for $t \geq k$ and otherwise 0. The break point k is set to different values, i.e., every five years. This specification is also extended to test for structural breaks in the elasticities as well as combinations of a structural break in the mean and a structural break in the slope coefficients (trend or elasticities). The logistic trend employed by Ho and Jorgenson (1998) is another alternative but we believe it is probably better suited for industrial countries, where there is less chance of reversals of trend directions due to policy failures and reversals.

For comparison, we also estimate the equations employing aggregate income as a scale variable. We employ the log of domestic GDP in the Armington function and the log of OECD GDP index in the CET function. The two income variables, which increase gradually, generally function and serve as time trends. Time trends seem to work best in improving the CET estimates.

3.2.3. Primary products

Given the plausible hypothesis that primary exports are not very responsive to relative prices in developing countries, the export data are adjusted to eliminate primary product export. Define PM = real primary product export. Then $E* = E - PM$. We replace E with E^* where applicable. In general, this seems to improve the elasticities for a few countries.

3.2.4. Seemingly unrelated regressions

Another method we used is that of seemingly unrelated regressions (SUR). SUR is designed to improve the efficiency in the variance estimation in cases when there is a correlation between the two sets of residuals. The parameter estimation may change, however, but not to a great extent. In our case, the signs most of the coefficients remain the same. Using subsamples after 1980 on the hypothesis that foreign trade is more responsive to prices during the widespread liberalization in eighties seems to lead to more positive CET estimates than using the full samples. However, the number of observations becomes very small and the estimates should be taken with great caution.

3.2.5. Other factors

We also examine the premise that a country's resource balance in the balance of payment account or the relative importance of the agriculture sector may affect export and import behavior by adding them as separate variables, with and without trend. A few of the estimation improve.

3.2.6. Simultaneity

We also tried a number of approaches that did not give good results. Among them was simultaneous estimation of the export function and the import function using instrumental variables methods. We also tried using a reduced form equation for P^d from which the trade elasticities can be derived:

$$\ln(P^d) = c + \alpha \ln(P^m) + \beta \ln(P^x) + \gamma \ln(\lambda) + u$$

where $\alpha = \frac{\sigma-1}{\sigma+\Omega}$, $\beta = \frac{1+\Omega}{\sigma+\Omega}$ and $\gamma = \frac{1}{\sigma+\Omega}$. However, the coefficients are over-identified because we have three equations for two unknowns. Note that if we consider $\alpha + \beta = 1$ we can further write the above regression as

$$\ln\left(\frac{P^d}{P^m}\right) = \beta \ln\left(\frac{P^x}{P^m}\right) + \gamma \ln(\lambda) + u.$$

Based on the and estimated from the restricted regression, the elasticities $\Omega = \frac{\beta}{\gamma} - 1$ and $\sigma = \frac{1-\beta}{\gamma} + 1$ can be uniquely determined. The results were not promising however.

3.2.7. Cointegration

We also tried unit root test and cointegration regressions. We tried different model specifications, including different lags, different orders of time polynomial, etc. The general conclusion is that the unit root null cannot be rejected for most of the variables (each country has four time series, i.e., $\ln\left(\frac{E}{D}\right)$, $\ln\left(\frac{P^e}{P^d}\right)$, $\ln\left(\frac{M}{D}\right)$ and $\ln\left(\frac{P^d}{P^m}\right)$). It should be noted however that proper cointegration analysis will require a deeper data analysis that is only possible with thorough examination of individual countries. Moreover, the absence of long time-series may increase the probability of spurious cointegration. On the other hand, because we are using annual data, longer time-series runs into the problem of structural change or breaks that are harder to handle in this methodology.[14] Keeping in mind the caveats, the cointegration results are also presented.

For the cointegration results of regressions 3.1 and 3.2, we tried the Johansen vector error-correction model (VECM) model (Johansen, 1988, 1991), the Phillips and Hansen fully-modified (FM) OLS model (Phillips and Hansen, 1990), and the

[14]See, for example, Gonzalo and Lee (1998), for a discussion of some of the pitfalls.

Park canonical cointegrating regressions(CCR) model (Park, 1992). However, not all results are consistent or improve with cointegration. Only the Johansen VECM estimation results are reported.

4. Conclusions

In this paper, we present the simplest structure of an open economy that provides a quick but clear method of quantifying the fiscal consequences of trade reform. The model can be solved analytically and we provide intuitive formulae for understanding the fiscal effects of tariff changes. We find in general that it matters what the values of the elasticites, σ and Ω, are relative to one another. Even if just one of the elasticities is low (close to zero), revenue will decline unequivocally from tariff reform, reaching close to the maximum drop regardless whether the other elasticity is high. This is because for imports to grow and tariff collection to compensate for the tax cut, the import elasticity σ has to be high. Because of the balance of trade constraint however, imports cannot substitute for domestic goods unless supply is able to switch towards exports. Hence, the export transformation elasticity Ω has to be high as well. In the example given, both σ and Ω have to be greater than 20 before revenue growth becomes really positive. Hence as substitution possibilities between foreign and domestic goods increase, a tariff reform can theoretically be self-financing. Conversely, if the elasticities are less than 'large', tax revenue will fall with tariff reduction and further fiscal adjustments are necessary.

The precise value of σ or Ω is an empirical issue and we provide empirical estimates of the possible range for about 60 countries using various approaches, including the Johansen method. These estimates can of course be refined with better data (e.g. export price indices) and better knowledge of the breakpoints and episodes of policy reforms and crisis. However, they do indicate that the elasticites only range from 0 to 3 in most cases, nowhere near the point at which tariff reform can be self-financing.

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5. Appendices

We compile time-series data of trade for selected countries from various sources: the World Bank's Economic and Social Database, the IMF's International Financial Statistics (IFS), as well as trade taxes from the IMF's Government Finance Statistics (GFS). Each variable in the model may be calibrated using different data sources and definitions. After considering various alternatives, we settle on the most widely available national and fiscal accounts, which give us the longest time-series:[15]

- X = total output of goods and services or GDP at factor cost in constant local currency (base year 1987)
- E = exports of goods and services in constant local currency from the national accounts (base year 1987)
- M = imports of goods and services in constant local currency from the national accounts (base year 1987)
- t_m = import duty defined as the ratio of tariff revenue to imports
- t_e = export duty (-export subsidy) defined as the ratio of export duty to exports

[15] Table 1 in the appendix summaries the list of variables we have tried and their alternative sources.

- P_x = price index of aggregate output or GDP at factor cost
- P_E = price index of exports (fob) from national accounts in local currency plus export duty rate
- P_M = price index of imports (cif) from national accounts in local currency plus import tariff rate
- $D = X - E$.
- $P_d = \frac{P_X X - P_E E}{D}$
- $Q = D + M$, total supply of goods and services, which should be equal to $C + I + G$, i.e., aggregate domestic demand in constant local currency in the national accounts
- $P_q = \frac{P_d D + P_E E}{Q}$

Note the exchange rate is not incorporated into the formula if all variables are based on the local currency.[16] Due to missing observations, we consider only

[16] For some countries such as Hong Kong and Singapore the domestic good price is not easy to define. Because of significant re-exports, the value of trade is greater than GDP (or aggregate output). Instead we can define Q = composite goods and P^q = price of composite goods such that

$$P^q = \frac{P^x X - (P^e E - P^m M)}{Q}$$

$$Q = X - (E - M).$$

countries which long time series in $\ln\left(\frac{E}{D}\right)$, $\ln\left(\frac{P^e}{P^d}\right)$, $\ln\left(\frac{M}{D}\right)$ and $\ln\left(\frac{P^d}{P^m}\right)$ required for our estimation. Over long period of time, we also noted that the trends of the price indices dominate the effects of the trade taxes on the relative prices. These trends are driven by significant long-term inflation in the domestic and world markets as well as devaluations of foreign exchange rate. In order to maintain a longer time-series in P_M and P_E, we decided to exclude the trade taxes, which are available only from the mid-seventies at the earliest (from the IMF GFS). This does not seem to affect the estimates of the elasticities when we tested most of the countries.

Table 1 Import Elasticities

Country	σ	t(σ)	Elasticity Dummy	SUM	Break Year	NOB	MODEL Method	Order
ANGOLA	0.47	1.42 *				6	ols w/ GDP	
ARGENTINA	0.79	3.71 *				10	ols w/o trend	
AUSTRIA	1.92	10.53				30	ols w/o trend	
	1.76	3.06				30	Johansen VECM, NDT	3
BAHAMAS; THE	1.50	1.91 *				8	ols w/ GDP	
	1.44	3.62 *				8	SUR w/ trend, from 1980	
BANGLADESH	0.57	2.31				22	ols w/o trend	
	0.55	2.83				22	ols w/ trend	
	0.54	2.98				22	ols w/ GDP	
	0.37	2.18				22	SUR w/ GDP, all available years	
	0.35	1.99				22	SUR w/ trend, all available years	
BELGIUM	0.61	1.79				34	ols w/o trend	
	0.26	6.66				34	ols w/ trend	
	0.26	6.67			70	34	ols w/ trend break	
	0.26	3.09				34	ols w/ GDP	
	0.27	3.27				34	SUR w/ GDP, all available years	
	0.24	6.41				34	SUR w/ trend, all available years	
BELIZE	0.66	2.04 *				15	ols w/ GDP	
	0.81	3.20 *				15	SUR w/ trend, from 1980	
BENIN	1.45	10.19				25	ols w/o trend	
	1.36	4.94				25	ols w/ trend	
	1.41	5.56				25	ols w/ GDP	
	1.17	5.46				25	SUR w/ GDP, all available years	
	1.18	4.71				25	SUR w/ trend, all available years	
	2.50	13.84				25	Johansen VECM, LDT	4
BURUNDI	0.89	2.73				23	ols w/ trend	
	0.68	1.80				23	ols w/ GDP	
	0.65	1.74				23	SUR w/ GDP, all available years	
	0.87	2.68				23	SUR w/ trend, all available years	
CAMEROON	0.22	2.83				22	ols w/o trend	
	0.22	2.45				22	ols w/ trend	
	0.23	2.67				22	ols w/ GDP	
	0.24	2.83				22	SUR w/ GDP, all available years	
	0.33	3.21 *				11	SUR w/ GDP, from 1980	
	0.24	2.59				22	SUR w/ trend, all available years	
	0.52	3.43 *				11	SUR w/ trend, from 1980	
CANADA	2.01	8.69				29	ols w/o trend	
	2.29	4.05				29	Johansen VECM, NDT	5
CHAD	0.75	3.90 *				14	ols w/ GDP	
	0.91	4.67 *				14	SUR w/ trend, all available years	
CHILE	0.43	6.45				35	ols w/ trend	
	0.43	6.31			80	35	ols w/ trend break	
	0.23	2.58				35	ols w/ GDP	
	0.25	2.74				35	SUR w/ GDP, all available years	
	0.51	8.12				35	SUR w/ trend, all available years	
	0.15	1.34				35	Johansen VECM, LDT	3
CHINA	0.06	0.35 *				15	ols w/ GDP	
	0.06	0.47 * x				15	ols w/ (X-M)/GDP w/ trend	

Table 1 Import Elasticities

Country	σ	t(σ)	Elasticity Dummy	SUM	Break Year	NOB	MODEL Method	Order
	0.06	0.60 *	x			15	ols w/ Agr/GDP w/o trend	
	0.07	0.40 *	x			15	SUR w/ GDP, from 1980	
COLOMBIA	1.20	5.81				27	ols w/o trend	
	1.13	5.35				27	ols w/ trend	
	1.14	5.39				27	ols w/ GDP	
	1.30	6.97				27	SUR w/ GDP, all available years	
	1.31	6.98				27	SUR w/ trend, all available years	
	5.18	3.29				27	Johansen VECM, QDT	6
CONGO	0.36	2.11				30	ols w/o trend	
	0.37	2.12				30	ols w/ trend	
	0.36	3.14			85	30	ols w/ trend break	
	0.38	2.11				30	ols w/ GDP	
	0.36	2.15				30	SUR w/ GDP, all available years	
	0.34	2.08				30	SUR w/ trend, all available years	
	0.25	1.27	x			30	Johansen VECM, NDT	4
COSTA RICA	0.87	4.65				35	ols w/o trend	
	0.56	5.42				35	ols w/ trend	
	0.54	6.04			75	35	ols w/ trend break	
	0.56	6.19				35	ols w/ GDP	
	0.59	7.35				35	SUR w/ GDP, all available years	
	0.62	6.97				35	SUR w/ trend, all available years	
CYPRUS	0.82	5.34				20	ols w/o trend	
	1.08	4.24				20	ols w/ (X-M)/GDP w/o trend	
DENMARK	0.78	8.03				34	ols w/o trend	
	0.86	4.16				34	Johansen VECM, NDT	3
DOMINICAN REPUBLIC	0.23	2.58				32	ols w/o trend	
	0.27	2.80				32	ols w/ trend	
	0.36	4.05			85	32	ols w/ trend break	
	0.26	2.62				32	ols w/ GDP	
	0.41	4.80				32	SUR w/ GDP, all available years	
	0.41	4.87				32	SUR w/ trend, all available years	
ECUADOR	0.27	1.56				30	Johansen VECM, LDT	7
EGYPT	0.10	0.89 *	x			13	ols w/o trend	
FINLAND	0.47	2.29				34	ols w/o trend	
	0.44	2.21				34	ols w/ (X-M)/GDP w/o trend	
	0.51	1.84 *				14	SUR w/ GDP, from 1980	
	1.33	2.46				34	Johansen VECM, NDT	3
GHANA	0.22	1.62				34	ols w/ (X-M)/GDP w/o trend	
	0.34	4.75				34	ols w/ Agr/GDP w/o trend	
GREECE	1.46	5.61				34	ols w/o trend	
	0.67	10.75			80	34	ols w/ trend break	
	0.96	9.09				34	ols w/ GDP	
	1.01	9.78				34	SUR w/ GDP, all available years	
	0.68	11.20				34	SUR w/ trend, all available years	
	0.77	12.57				34	Johansen VECM, LDT	5
GRENADA	0.22	0.46 *	x			9	SUR w/ trend, from 1980	
GUATEMALA	0.49	3.66				35	ols w/o trend	
	0.43	1.24	x			35	ols w/ GDP	

Table 1 Import Elasticities

Country	σ	t(σ)		Elasticity Dummy	SUM	Break Year	NOB	MODEL Method	Order
	5.14	0.93	x				35	Johansen VECM, NDT	7
GUINEA-BISSAU	0.05	0.32 *	x				8	ols w/ GDP	
	0.08	0.46 *	x				8	SUR w/ GDP, from 1980	
	0.06	0.37 *	x				8	SUR w/ trend, from 1980	
HAITI	0.69	3.80					29	ols w/o trend	
	0.62	9.63					29	ols w/ GDP	
	0.64	10.01					29	SUR w/ GDP, all available years	
	1.62	2.99					29	Johansen VECM, NDT	4
HONDURAS	0.29	2.24					35	SUR w/ GDP, all available years	
	0.28	2.05					35	SUR w/ trend, all available years	
	0.43	1.80					35	Johansen VECM, NDT	2
HUNGARY	0.14	1.46					25	ols w/ (X-M)/GDP w/o trend	
	0.16	1.33 *	x				15	SUR w/ GDP, from 1980	
	0.37	1.70 *					15	SUR w/ trend, from 1980	
	0.04	0.66	x				25	Johansen VECM, NDT	2
INDIA	0.29	1.45				75	35	ols w/ trend break	
	0.16	0.97	x				35	SUR w/ GDP, all available years	
	0.45	2.76 *					15	SUR w/ GDP, from 1980	
	0.14	0.89	x				35	SUR w/ trend, all available years	
	0.48	2.84 *					15	SUR w/ trend, from 1980	
INDONESIA	1.39	5.94					28	ols w/o trend	
	1.32	8.91					28	ols w/ trend	
	1.26	8.90					28	ols w/ GDP	
	1.02	8.88					28	SUR w/ GDP, all available years	
	1.11	8.53					28	SUR w/ trend, all available years	
	1.14	4.76					28	Johansen VECM, NDT	4
IRAN; ISLAMIC REPUBLIC OF	0.06	0.71 *	x				19	SUR w/ trend, all available years	
IRELAND	1.68	7.63					34	ols w/o trend	
	0.36	4.67					34	ols w/ trend	
	0.37	4.76				80	34	ols w/ trend break	
	0.43	5.16		-0.17	0.26	80	34	ols w/ elasticity dummy	
	0.43	5.31					34	ols w/ GDP	
	0.52	6.84					34	SUR w/ GDP, all available years	
	0.38	5.02					34	SUR w/ trend, all available years	
	2.95	6.31					34	Johansen VECM, LDT	7
	0.44	6.08					34	Johansen VECM, QDT	1
ISRAEL	0.36	5.02					27	ols w/o trend	
	0.35	4.81					27	ols w/ trend	
	0.33	4.32					27	ols w/ GDP	
	0.34	4.59					27	SUR w/ GDP, all available years	
	0.35	4.84					27	SUR w/ trend, all available years	
	0.32	6.21					27	Johansen VECM, LDT	2
JAMAICA	0.24	1.69				70	34	ols w/ trend break	
	0.37	1.69 *					14	SUR w/ GDP, from 1980	
	0.24	1.96					34	SUR w/ trend, all available years	
	0.29	2.08 *					14	SUR w/ trend, from 1980	
	1.80	2.44					34	Johansen VECM, QDT	1
JAPAN	0.14	1.42		0.47	0.61	75	33	ols w/ elasticity dummy	

Table 1 Import Elasticities

Country	σ	t(σ)		Elasticity Dummy	SUM	Break Year	NOB	MODEL Method	Order
	0.91	4.81					33	Johansen VECM, LDT	1
KENYA	0.88	6.66					31	ols w/ trend	
	0.94	7.40				80	31	ols w/ trend break	
	0.93	5.21		-0.04	0.89	70	31	ols w/ elasticity dummy	
	0.75	4.04					31	ols w/ GDP	
	0.90	5.63					31	SUR w/ GDP, all available years	
	0.79	6.72					31	SUR w/ trend, all available years	
	0.66	2.94					31	Johansen VECM, NDT	2
KOREA; REPUBLIC OF	0.06	0.29	x				35	SUR w/ trend, all available years	
	0.88	4.30	*				15	SUR w/ trend, from 1980	
KUWAIT	1.44	5.48	*				19	ols w/ trend	
	1.31	6.91	*				19	ols w/ GDP	
	1.20	6.48	*				19	SUR w/ GDP, all available years	
	1.42	5.81	*				19	SUR w/ trend, all available years	
LAO PEOPLE'S DEMOCRATIC REPUB	0.84	5.76	*				10	SUR w/ trend, from 1980	
LESOTHO	0.55	2.48	*				15	ols w/ GDP	
	0.48	1.75	*				15	SUR w/ trend, from 1980	
MADAGASCAR	1.08	11.60					34	ols w/o trend	
	1.18	6.91					34	ols w/ GDP	
	0.97	7.51					34	SUR w/ GDP, all available years	
	1.30	13.17					34	Johansen VECM, NDT	3
MALAWI	0.84	8.52					31	ols w/o trend	
	0.55	3.37					31	ols w/ trend	
	0.75	5.27				80	31	ols w/ trend break	
	0.66	3.55					31	ols w/ GDP	
	0.66	3.78					31	SUR w/ GDP, all available years	
	0.54	3.46					31	SUR w/ trend, all available years	
	0.83	4.64					31	Johansen VECM, NDT	6
MALAYSIA	2.14	1.88					25	ols w/o trend	
	1.66	3.30					25	ols w/ trend	
	1.78	3.74					25	ols w/ GDP	
	0.90	2.74					25	SUR w/ GDP, all available years	
	1.11	3.20					25	SUR w/ trend, all available years	
	2.37	4.06					25	Johansen VECM, LDT	2
MALDIVES	1.38	0.55	* x				6	SUR w/ trend, from 1980	
MALI	1.06	6.61					25	ols w/o trend	
	0.79	3.87					25	ols w/ GDP	
	0.70	3.49					25	SUR w/ GDP, all available years	
	1.25	11.40					25	Johansen VECM, NDT	3
MALTA	2.86	1.43					33	Johansen VECM, LDT	5
MAURITIUS	0.69	3.92					34	ols w/ trend	
	0.72	4.03				80	34	ols w/ trend break	
	0.67	4.09					34	ols w/ GDP	
	0.53	3.68					34	SUR w/ GDP, all available years	
	0.61	3.93					34	SUR w/ trend, all available years	
	2.29	3.60					34	Johansen VECM, LDT	6
MEXICO	1.04	4.64					35	ols w/o trend	
	0.97	6.51					35	ols w/ trend	

Table 1 Import Elasticities

Country	σ	t(σ)	Elasticity Dummy	SUM	Break Year	NOB	MODEL Method	Order
	1.07	9.61			85	35	ols w/ trend break	
	1.30	9.59	-0.70	0.60	85	35	ols w/ elasticity dummy	
	0.97	5.40				35	ols w/ GDP	
	1.17	8.01				35	SUR w/ GDP, all available years	
	1.16	8.95				35	SUR w/ trend, all available years	
MOROCCO	0.26	1.72				30	ols w/o trend	
	0.46	2.54				30	ols w/ trend	
	0.63	3.89			75	30	ols w/ trend break	
	0.46	2.47				30	ols w/ GDP	
	0.45	2.44				30	SUR w/ GDP, all available years	
	0.44	2.42				30	SUR w/ trend, all available years	
MYANMAR	0.26	1.69				28	ols w/ (X-M)/GDP w/o trend	
	0.48	5.51				28	ols w/ (X-M)/GDP w/ trend	
	0.83	3.64 *				15	SUR w/ trend, from 1980	
	0.17	2.09				28	Johansen VECM, NDT	5
NAMIBIA	0.81	1.91 *				10	ols w/ GDP	
	0.64	1.58 *				10	SUR w/ trend, from 1980	
NETHERLANDS	1.06	8.11				32	ols w/o trend	
	2.93	1.65				32	Johansen VECM, NDT	1
NIGERIA	0.63	6.59				22	ols w/ trend	
	0.77	8.04				22	ols w/ GDP	
	0.76	8.00				22	SUR w/ GDP, all available years	
	0.64	6.84				22	SUR w/ trend, all available years	
NORWAY	0.49	5.76				34	ols w/o trend	
	0.36	2.36				34	ols w/ trend	
	0.67	4.82			85	34	ols w/ trend break	
	0.40	4.13	0.80	1.19	70	34	ols w/ elasticity dummy	
	0.33	2.47				34	ols w/ GDP	
	0.31	2.35				34	SUR w/ GDP, all available years	
	0.32	2.12				34	SUR w/ trend, all available years	
	0.63	5.67				34	Johansen VECM, NDT	3
PAKISTAN	0.47	13.69				35	ols w/o trend	
	0.49	6.15				35	ols w/ trend	
	0.61	7.95			70	35	ols w/ trend break	
	0.43	6.16				35	ols w/ GDP	
	0.43	6.22				35	SUR w/ GDP, all available years	
	0.92	4.72 *				15	SUR w/ GDP, from 1980	
	0.49	6.14				35	SUR w/ trend, all available years	
	0.93	4.85 *				15	SUR w/ trend, from 1980	
	0.46	15.03				35	Johansen VECM, NDT	1
PANAMA	2.63	1.70 *				7	ols w/ GDP	
PAPUA NEW GUINEA	0.28	1.92				21	ols w/o trend	
	0.34	2.47				21	ols w/ trend	
	0.31	2.10				21	ols w/ GDP	
	0.31	2.10				21	SUR w/ GDP, all available years	
	0.34	2.47				21	SUR w/ trend, all available years	
PARAGUAY	1.37	3.50				35	ols w/o trend	
	0.62	2.03			85	35	ols w/ trend break	

Table 1 Import Elasticities

Country	σ	t(σ)		Elasticity Dummy	SUM	Break Year	NOB	MODEL Method	Order
	0.93	4.50					35	SUR w/ GDP, all available years	
	0.76	3.81					35	SUR w/ trend, all available years	
	3.19	4.19					35	Johansen VECM, NDT	3
PHILIPPINES	0.73	6.31					35	ols w/ trend	
	0.73	6.37				75	35	ols w/ trend break	
	0.99	6.37					35	ols w/ GDP	
	1.08	7.97					35	SUR w/ GDP, all available years	
	0.97	3.03 *					15	SUR w/ GDP, from 1980	
	0.75	6.85					35	SUR w/ trend, all available years	
	1.51	2.40 *					15	SUR w/ trend, from 1980	
PORTUGAL	0.63	4.73					27	ols w/o trend	
	0.61	7.63					27	ols w/ trend	
	0.65	7.63					27	ols w/ GDP	
	0.67	4.47					27	ols w/ (X-M)/GDP w/o trend	
	0.59	6.40					27	ols w/ (X-M)/GDP w/ trend	
	0.67	8.75					27	SUR w/ GDP, all available years	
	0.63	8.38					27	SUR w/ trend, all available years	
	0.41	3.03 *					13	SUR w/ trend, from 1980	
	0.49	3.93					27	Johansen VECM, LDT	3
RWANDA	0.17	1.46					33	ols w/ GDP	
	0.16	1.44					33	SUR w/ GDP, all available years	
	0.40	3.96 *					13	SUR w/ GDP, from 1980	
	0.40	4.09 *					13	SUR w/ trend, from 1980	
	0.46	4.91					33	Johansen VECM, LDT	4
SALVADOR, EL	0.40	1.06	x				35	Johansen VECM, NDT	6
SENEGAL	0.27	1.34 *					14	ols w/ GDP	
	0.27	1.24 *	x				14	SUR w/ trend, all available years	
SEYCHELLES	0.68	2.09 *					7	ols w/ GDP	
	0.85	2.27 *					7	SUR w/ trend, from 1980	
SIERRA LEONE	1.10	7.53					24	ols w/o trend	
	0.50	2.49					24	ols w/ trend	
	0.99	5.94					24	ols w/ GDP	
	1.11	6.93					24	SUR w/ GDP, all available years	
	0.64	3.54					24	SUR w/ trend, all available years	
SOMALIA	0.82	4.47 *					8	SUR w/ trend, all available years	
	0.82	4.47 *					8	SUR w/ trend, from 1980	
SOUTH KOREA	1.64	9.20					35	ols w/o trend	
	1.29	5.60					35	ols w/ (X-M)/GDP w/o trend	
SRI LANKA	0.90	4.92					32	ols w/o trend	
	0.76	4.15					32	ols w/ trend	
	1.02	6.92				75	32	ols w/ trend break	
	0.75	3.96		0.93	1.68	70	32	ols w/ elasticity dummy	
	0.66	3.55					32	ols w/ GDP	
	0.58	3.79					32	SUR w/ GDP, all available years	
	0.62	4.32					32	SUR w/ trend, all available years	
	3.27	6.58					32	Johansen VECM, LDT	3
ST. KITTS AND NEVIS	2.80	1.59 *					6	ols w/ GDP	
	2.67	1.41 *					6	SUR w/ trend, from 1980	

Table 1 Import Elasticities

Country	σ	t(σ)		Elasticity Dummy	SUM	Break Year	NOB	MODEL Method	MODEL Order
ST. VINCENT AND THE GRENADINES	1.09	2.30 *					11	ols w/ GDP	
	0.47	1.38 *					11	SUR w/ trend, all available years	
SWAZILAND	0.38	3.23 *					18	ols w/ trend	
	0.38	3.36 *					18	ols w/ GDP	
	0.40	3.57 *					18	SUR w/ GDP, all available years	
	0.35	3.02 *					15	SUR w/ GDP, from 1980	
	0.41	3.58 *					18	SUR w/ trend, all available years	
SWEDEN	0.41	1.62					34	ols w/o trend	
	0.17	2.68				70	34	ols w/ trend break	
	0.14	2.62					34	ols w/ GDP	
	0.15	2.96					34	SUR w/ GDP, all available years	
	0.14	2.13					34	SUR w/ trend, all available years	
	1.17	0.67	x				34	Johansen VECM, NDT	2
SWITZERLAND	1.38	17.92					34	ols w/o trend	
	1.58	19.85					34	ols w/ (X-M)/GDP w/o trend	
	1.61	10.33					34	Johansen VECM, NDT	1
SYRIAN ARAB REPUBLIC	0.12	1.35 *					17	ols w/ trend	
	0.09	1.21 *	x				17	ols w/ GDP	
	0.11	1.37 *					17	SUR w/ GDP, all available years	
	0.13	1.54 *					17	SUR w/ trend, all available years	
TAIWAN	1.41	3.50					32	ols w/o trend	
	0.18	1.86		1.24	1.41	70	32	ols w/ elasticity dummy	
THAILAND	0.97	4.82					35	ols w/ trend	
	0.93	5.05				85	35	ols w/ trend break	
	0.89	4.88					35	ols w/ GDP	
	1.13	9.09					35	SUR w/ GDP, all available years	
	1.07	7.41					35	SUR w/ trend, all available years	
TOGO	0.97	3.45 *					18	ols w/o trend	
	0.47	1.60 *					18	ols w/ trend	
	0.46	1.93 *					18	SUR w/ GDP, all available years	
	0.63	2.50 *					8	SUR w/ GDP, from 1980	
	0.58	2.22 *					18	SUR w/ trend, all available years	
	0.77	2.86 *					8	SUR w/ trend, from 1980	
TRINIDAD AND TOBAGO	0.81	28.34					28	ols w/o trend	
	0.62	7.82					28	ols w/ trend	
	0.78	24.41					28	ols w/ GDP	
	0.76	24.34					28	SUR w/ GDP, all available years	
	0.61	8.35					28	SUR w/ trend, all available years	
	1.01	10.39					28	Johansen VECM, NDT	2
TUNISIA	3.14	3.61					27	Johansen VECM, NDT	6
TURKEY	0.33	1.46 *					8	SUR w/ trend, from 1980	
UNITED ARAB EMIRATES	0.76	4.32 *					15	SUR w/ trend, all available years	
	0.71	2.32 *					10	SUR w/ trend, from 1980	
UNITED STATES	0.71	2.02					34	ols w/ GDP	
	0.54	1.57					34	SUR w/ GDP, all available years	
	2.61	7.72 *					14	SUR w/ GDP, from 1980	
	2.40	0.82	x				34	Johansen VECM, NDT	4
	1.47	0.77	x				34	Johansen VECM, NDT	5

Table 1 Import Elasticities

Country	σ	t(σ)	Elasticity Dummy	SUM	Break Year	NOB	MODEL Method	Order
VENEZUELA	0.32	1.12 * x				15	SUR w/ GDP, from 1980	
YUGOSLAVIA	0.64	9.31				21	ols w/o trend	
	0.45	4.95				21	ols w/ trend	
	0.53	7.14				21	ols w/ GDP	
	0.55	7.41				21	SUR w/ GDP, all available years	
	0.44	4.89				21	SUR w/ trend, all available years	
ZIMBABWE	0.49	2.87 *				15	ols w/o trend	
	0.51	2.71 *				15	ols w/ trend	
	0.51	2.75 *				15	ols w/ GDP	
	0.51	2.72 *				15	SUR w/ trend, all available years	

Notes:
σ = Armington elasticity
t(σ) = t statistic
Model: Model Specification
NOB = Number of observations
NDT - No deterministic trend in the data, VECM
LDT - Linear deterministic trend in the data, VECM
QDT - Quadratic deterministic trend in the data, VECM
Order: Number of lags of the VECM model.VECM
SUM - The sum of elasticity and dummy
* = Less than 20 observations
x = Insignifcant at 90% confidence level

Table 2 Export Elasticities, Selected Estimates

Country	Ω	t(Ω)		Dummy	SUM	Break Year	NOB	Model Method	Order
ARGENTINA	0.31	1.43 *					10	ols w/ trend	
	0.37	2.20 *					10	ols w/ GDP	
	0.39	1.81 *					10	SUR w/ trend, from 1980	
AUSTRIA	0.78	4.87					30	ols w/ trend	
	0.94	6.30				75	30	ols w/ trend break	
	0.98	5.27		0.15	1.13	75	30	ols w/ elasticity dummy	
	0.71	4.55					30	SUR w/ trend, all available years	
	0.47	4.42					30	Johansen VECM, LDT	4
BANGLADESH	0.60	1.94					22	ols w/o trend	
	0.72	2.55					22	ols w/ (X-M)/GDP w/o trend	
	0.32	1.58					20	ols excl. Agr exports w/o trend	
BELGIUM	0.39	0.13	x				34	Johansen VECM, NDT w/ Agr/GDP	1
BOLIVIA	0.35	3.04 *					13	ols w/o trend	
CAMEROON	0.26	1.13 *	x				11	SUR w/ GDP, from 1980	
CANADA	1.57	1.19	x				29	Johansen VECM, NDT	5
CHAD	0.12	0.23 *	x				6	SUR w/ trend, from 1980	
CHILE	0.05	0.54 *	x				15	SUR w/ trend, from 1980	
CHINA	0.23	4.36 *					15	ols w/o trend	
	0.21	4.77 *					15	ols w/ (X-M)/GDP w/o trend	
	0.15	1.81 *					15	ols w/ Agr/GDP w/o trend	
COLOMBIA	0.32	2.01 *					15	SUR w/ GDP, from 1980	
	0.52	3.47 *					15	SUR w/ trend, from 1980	
CONGO	0.95	1.87					30	Johansen VECM, NDT w/ Agr/GDP	5
COSTA RICA	0.70	1.55					35	Johansen VECM, NDT w/ Agr/GDP	1
CYPRUS	0.93	1.26	x				20	ols w/ Agr/GDP w/ trend	
DENMARK	0.03	0.31	x				34	ols w/ trend	
	0.02	0.32	x				34	ols w/ (X-M)/GDP w/ trend	
	0.03	0.29	x				34	SUR w/ trend, all available years	
DOMINICAN REPUBLIC	2.73	3.95					32	Johansen VECM, NDT	3
ECUADOR	12.69	3.09					30	Johansen VECM, NDT	1
EGYPT	0.11	1.72 *					13	ols w/o trend	
	0.10	1.69 *					13	ols w/ GDP	
	0.09	1.43 *					13	SUR w/ trend, all available years	
FINLAND	0.47	2.72					34	ols w/ trend	
	0.61	3.36				75	34	ols w/ trend break	
	0.32	1.90					34	ols w/ GDP	
	0.25	1.53					34	SUR w/ GDP, all available years	
	2.05	3.82 *					14	SUR w/ GDP, from 1980	
	0.43	2.51					34	SUR w/ trend, all available years	
	1.96	6.06 *					14	SUR w/ trend, from 1980	
	0.11	0.78	x				34	Johansen VECM, LDT	4
GHANA	0.10	1.96					34	ols w/ trend	
	0.11	2.02				80	34	ols w/ trend break	
	0.09	1.72					34	SUR w/ trend, all available years	
	0.42	4.78					34	Johansen VECM, QDT	4
GREECE	0.78	12.63					34	Johansen VECM, QDT	5
GUATEMALA	0.33	1.90				85	35	ols w/ trend break	
	1.70	5.25					35	Johansen VECM, LDT	2

Table 2 Export Elasticities, Selected Estimates

					Break		Model	
Country	Ω	t(Ω)	Dummy	SUM	Year	NOB	Method	Order
HAITI	0.43	3.48				29	ols w/ trend	
	0.40	3.88				29	ols w/ GDP	
	0.37	3.62				29	SUR w/ GDP, all available years	
	0.32	2.74				29	SUR w/ trend, all available years	
	0.30	3.57				29	Johansen VECM, LDT	5
	0.30	3.55				29	Johansen VECM, QDT	5
HONDURAS	0.19	1.14	x			35	Johansen VECM, LDT	4
HUNGARY	0.56	2.59				25	ols w/ (X-M)/GDP w/ trend	
INDIA	0.44	5.14				35	ols w/o trend	
	0.41	2.32			70	35	ols w/ trend break	
	0.45	2.66				35	ols w/ GDP	
	0.43	2.58				35	SUR w/ GDP, all available years	
	1.02	1.94 *				15	SUR w/ GDP, from 1980	
	0.33	1.80				35	SUR w/ trend, all available years	
	0.23	4.81				35	Johansen VECM, NDT	6
INDONESIA	0.75	1.62				28	Johansen VECM, NDT w/ Agr/GDP	2
IRAN	0.14	2.03 *				19	ols w/o trend	
	0.33	1.70 *				19	ols excl. Agr exports w/o trend	
IRELAND	1.01	2.17				28	ols excl. Agr exports w/o trend	
ISRAEL	0.66	2.55 *				15	SUR w/ GDP, from 1980	
JAMAICA	0.45	3.61				34	ols w/o trend	
	0.22	1.46				34	ols w/ trend	
	0.30	1.94			75	34	ols w/ trend break	
	0.29	1.96				34	ols w/ GDP	
	0.38	2.38				28	ols excl. Agr exports w/o trend	
	1.55	3.38				34	Johansen VECM, NDT	4
	1.47	3.46				34	Johansen VECM, LDT	4
JAPAN	0.56	1.92				33	ols w/ trend	
	1.06	4.20			80	33	ols w/ trend break	
	0.90	5.87				33	ols w/ GDP	
	0.93	4.22				28	ols excl. Agr exports w/ trend	
	1.04	7.11				33	SUR w/ GDP, all available years	
	0.52	1.84				33	SUR w/ trend, all available years	
	3.46	2.05				33	Johansen VECM, NDT	3
	2.01	1.33				33	Johansen VECM, NDT	2
JORDAN	6.10	2.67 *				10	ols w/ GDP	
	7.25	2.38 *				10	SUR w/ trend, all available years	
	7.25	2.38 *				10	SUR w/ trend, from 1980	
KOREA; REPUBLIC OF	0.94	3.64				35	ols w/ GDP	
	1.17	2.81				35	SUR w/ trend, all available years	
KUWAIT	0.45	1.02 *	x			9	SUR w/ GDP, from 1980	
MALAYSIA	0.53	1.47				22	ols excl. Agr exports w/o trend	
	2.43	1.68				25	Johansen VECM, NDT	3
	3.24	3.27				25	Johansen VECM, NDT	5
MALI	3.78	0.77				25	Johansen VECM, NDT	3
MALTA	1.71	1.17				33	Johansen VECM, NDT	2
MAURITIUS	0.14	0.35 *				14	SUR w/ trend, from 1980	
MEXICO	0.42	2.95			85	35	ols w/ trend break	

Table 2 Export Elasticities, Selected Estimates

					Break		Model	
Country	Ω	t(Ω)	Dummy	SUM	Year	NOB	Method	Order
	0.37	2.09				35	ols w/ Agr/GDP w/ trend	
	0.47	2.31				28	ols excl. Agr exports w/o trend	
	0.22	1.18				35	SUR w/ GDP, all available years	
	0.72	4.80 *				15	SUR w/ GDP, from 1980	
	0.76	6.13 *				15	SUR w/ trend, from 1980	
	2.54	1.49				35	Johansen VECM, LDT	4
MOROCCO	0.89	3.76				30	Johansen VECM, NDT w/ Agr/GDP	4
MYANMAR	0.24	0.44 x				28	Johansen VECM, NDT w/ Agr/GDP	4
NETHERLANDS	0.09	1.81 *				12	SUR w/ GDP, from 1980	
NORWAY	0.27	0.49 x				34	Johansen VECM, NDT w/ Agr/GDP	2
PAKISTAN	1.50	1.43				35	Johansen VECM, NDT	6
PAPUA NEW GUINEA	0.02	0.14 * x				21	ols w/ Agr/GDP w/ trend	
PARAGUAY	1.67	0.97 x				35	Johansen VECM, NDT w/ Agr/GDP	6
PHILIPPINES	0.23	2.57				35	Johansen VECM, NDT w/ Agr/GDP	6
PORTUGAL	0.23	2.24 *				13	SUR w/ GDP, from 1980	
	0.20	1.69 *				13	SUR w/ trend, from 1980	
SALVADOR, EL	0.19	1.88				35	ols w/o trend	
	0.23	10.27				35	Johansen VECM, LDT	6
SENEGAL	0.35	1.63 *				14	ols w/ (X-M)/GDP w/o trend	
SOUTH KOREA	1.30	2.36				35	ols w/ trend	
	1.42	3.36			80	35	ols w/ trend break	
	0.54	2.32				35	SUR w/ GDP, all available years	
SWEDEN	0.39	5.83			75	34	ols w/ trend break	
	0.44	2.04 *				14	SUR w/ GDP, from 1980	
	0.62	5.06 *				14	SUR w/ trend, from 1980	
	0.43	0.21 x				34	Johansen VECM, NDT	1
SWITZERLAND	0.42	1.22 x			80	34	ols w/ trend break	
	0.61	2.92 *				14	SUR w/ trend, from 1980	
SYRIAN ARAB REPUBLIC	0.09	1.43 *				17	ols w/o trend	
	0.09	1.35 *				17	ols w/ (X-M)/GDP w/o trend	
TAIWAN	0.60	3.25				32	ols w/ trend	
	0.69	4.36			75	32	ols w/ trend break	
	0.67	3.35	0.25	0.92	75	32	ols w/ elasticity dummy	
	0.17	1.65				32	ols w/ GDP	
	0.14	1.36				32	SUR w/ GDP, all available years	
	0.67	4.18				32	SUR w/ trend, all available years	
THAILAND	2.89	3.00				35	Johansen VECM, LDT w/ Agr/GDP	3
TUNISIA	0.31	1.91				27	ols w/o trend	
	0.39	2.41				27	ols w/ (X-M)/GDP w/o trend	
TURKEY	0.73	2.91 *				8	ols w/ GDP	
	0.70	2.61 *				8	SUR w/ trend, from 1980	
UGANDA	0.08	1.09 * x				12	ols w/o trend	
	0.06	1.02 * x				12	ols w/ GDP	
	0.06	0.94 * x				12	SUR w/ GDP, from 1980	
	0.05	0.74 * x				12	SUR w/ trend, from 1980	
UNITED STATES	0.39	1.77				34	ols w/ trend	
	0.49	2.28			80	34	ols w/ trend break	
	0.39	1.78				34	SUR w/ trend, all available years	

Table 2 Export Elasticities, Selected Estimates

Country	Ω	t(Ω)	Dummy	SUM	Break Year	NOB	Model Method	Order
	2.77	1.94 *				14	SUR w/ trend, from 1980	
	5.86	2.02				34	Johansen VECM, NDT	6
VENEZUELA	0.15	1.50 *				15	SUR w/ GDP, from 1980	
	0.17	1.68 *				15	SUR w/ trend, from 1980	

Notes:

σ = Armington elasticity

t(σ) = t statistic

Model: Model Specification

NOB = Number of observations

NDT - No deterministic trend in the data, VECM

LDT - Linear deterministic trend in the data, VECM

QDT - Quadratic deterministic trend in the data, VECM

Order: Number of lags of the VECM model.VECM

SUM - The sum of elasticity and dummy

* = Less than 20 observations

x = Insignifcant at 90% confidence level

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